

Claims Listing

Sub B' 1 1. (currently amended) ~~An~~ A dynamic optical router for routing optical  
2 signals to a plurality of output channels, comprising at least one frequency router  
3 having a plurality of input ports and a plurality of output ports, characterized in  
4 that: each optical signal contains destination information, at least one input port  
5 simultaneously receives at least two optical signals to be frequency routed, ~~and~~  
6 at least one output port simultaneously ~~presents~~ ~~presenting~~ at least two  
7 frequency routed optical signals, and at least one output port couples routed  
8 optical signals to a plurality of output channels, wherein each optical signal to be  
9 frequency routed is dynamically tuned to a particular color ~~colored~~ in response  
10 to its destination information.

2 2. (original) The optical router of Claim 1, further comprising:  
3 a plurality of combiners, one combiner for combining the at least  
4 two optical signals to be routed; and  
5 a plurality of receivers, one receiver for separating each of the at  
6 least two routed optical signals to intended destinations in response to  
destination information.

1 3. (original) The optical router of Claim 2, wherein the frequency router  
2 routes optical signals by color, the at least two optical signals to be routed having  
3 different colors, and the at least two routed optical signals having different  
4 colors.

1 4. (original) The optical router of Claim 3, wherein the optical router  
2 receives packets of data, each packet of data having destination information, each  
3 combiner coupled with at least one converter of a plurality, each converter  
4 converting at least one packet of data to an optical signal colored in response to  
5 the destination information of the corresponding at least one packet of data.

1 5. (currently amended) The optical router ~~converter~~ of Claim 4, wherein the  
2 frequency router comprises:

3 at least one input waveguide;

4 at least one output waveguide;

5 a first and a second free space region, the first free space region  
6 coupled with the at least one input waveguide and the second free space  
7 region coupled with the at least one output waveguide; and

8 an optical grating having a plurality of unequal length waveguides,  
9 each unequal length waveguide coupled between the first free space  
10 region and the second free space region.

1 6. (original) The optical router of Claim 5, wherein each receiver comprises:

2 at least two tunable filters; and

3 at least one splitter for splitting the at least two routed optical  
4 signals between the at least two tunable filters such that at least one of the  
5 at least two tunable filters is tuned to pass one of the at least two routed  
6 optical signals to an intended destination.

1 7. **(original)** The optical router of Claim 5, wherein each receiver comprises:

2 at least two second stage converters;

3 at least one demultiplexer for separating each of the at least two  
4 routed optical signals into one of the at least two second stage converters,  
5 each second stage converter converting one of the routed optical signals to  
6 a second stage optical signal colored in response to the destination  
7 information of the corresponding at least one packet of data; and

8 at least one second stage combiner for combining second stage  
9 optical signals into a combined second stage optical signal to be frequency  
10 routed.

1 8. **(original)** The optical router of Claim 7, further comprising:

2 a second stage frequency router having a plurality of second stage  
3 input ports and a plurality of second stage output ports, one second stage  
4 input port receiving the combined second stage optical signal to be  
5 frequency routed; and

6 a plurality of output stage demultiplexers, each output stage  
7 demultiplexer being coupled one second stage output port of the second

8 stage frequency router such that each second stage optical signal of the  
9 combined routed second stage optical signal is presented to an intended  
10 destination.

1 9. (currently amended) ~~An~~ A dynamic optical router for routing a plurality  
2 of packets, N, of data to a plurality of output channels, each packet of data  
3 having destination information, the optical router comprising:

4 a plurality of converters, each converter receiving a packet of data  
5 and providing an optical signal to be combined and routed, each optical  
6 signal being colored in response to the destination information of the  
7 respective packet of data;

8 a plurality of combiners, one combiner combining at least two  
9 optical signals to be routed; characterized by:

10 at least one frequency router having a plurality of input ports, M,  
11 and a plurality of output ports, M, at least one output port simultaneously  
12 receiving the at least two optical signals to be routed, ~~and~~ at least one  
13 output port simultaneously presenting at least two routed optical signals,  
14 and at least one output port coupling routed optical signals to a plurality  
15 of output channels, the at least one frequency router routing optical  
16 signals by color dynamically in response to said destination information;

17 a plurality of receivers having a plurality of outputs corresponding  
18 to said output channels, which in turn correspond to intended  
19 destinations; and

20 a plurality of splitters, one splitter splitting the at least two routed  
21 optical signals ~~between at least two receivers such that along separate~~

22 optical paths toward at least two output channels, at least one of the at  
23 least two receivers a receiver in one of the paths being is tuned to pass one  
24 of the at least two routed optical signals to an intended destination.

1 10. (original) The optical router of Claim 9, wherein each converter comprise  
2 a tunable light source for generating one optical signal, and for coloring the one  
3 optical signal in response to the destination information of the respective packet  
4 of data, and wherein each receiver comprises a tunable filter for tuning to a color  
5 to pass one of the at least two routed optical signals to an intended destination.

1 11. (original) The optical router of Claim 10, wherein each converter  
2 comprises a converter for converting at least one packet of data to the one optical  
3 signal colored in response to destination information, and wherein each receiver  
4 comprises a converter for converting a routed optical signal into a routed packet  
5 of data.

1 12. (original) The optical router of Claim 11, further comprising a scheduler  
2 for scheduling the conversion each packet of data into an optical signal and for  
3 scheduling the tuning of the tunable filter.

1 13. (currently amended) The optical router ~~converter~~ of Claim 11, wherein  
2 the frequency router comprises:

3 at least one input waveguide;

4 at least one output waveguide;

5 a first and a second free space region, the first free space region  
6 coupled with the at least one input waveguide and the second free space  
7 region coupled with the at least one output waveguide; and

8 an optical grating having a plurality of unequal length waveguides,  
9 each unequal length waveguide coupled between the first free space  
10 region and the second free space region.

14. (currently amended) ~~An~~ A dynamic optical router for routing a plurality  
of packets, N, of data to a plurality of output channels, each packet of data  
having destination information, the optical router comprising:

4 a plurality of first stage converters, each converter receiving a  
5 packet of data and providing an optical signal to be combined and routed,  
6 each optical signal being colored in response to the destination  
7 information of the respective packet of data;

8 a plurality of first stage combiners, one combiner combining at least  
9 two optical signals to be routed, characterized by:

10 a first stage frequency router having a plurality of input ports, M,  
11 and a plurality of output ports, M, at least one input output-port  
12 simultaneously receiving the combined at least two optical signals to be  
13 routed, ~~and~~ at least one output port simultaneously presenting at least  
14 two first stage routed optical signals and at least one output port coupling  
15 routed optical signals to a plurality of output channels, the first stage

16 frequency router routing optical signals by color dynamically in response  
17 to said destination information;

18 a plurality of second stage converters, each second stage converter  
19 providing a second stage optical signal to be combined and routed, each  
20 second stage optical signal being colored in response to the destination  
21 information of the respective packet of data; and each second stage  
22 converter including a buffer that delays selected packets based on the  
23 destination information;

24 a plurality of second stage demultiplexers, one second stage  
25 demultiplexer presenting each of the at least two routed optical signals  
26 from the first stage frequency router to a second stage converter;

27 a plurality of second stage combiners, one second stage combiner  
28 combining at least two second stage optical signals to be routed; and

29 a second stage frequency router having a plurality of second stage  
30 input ports, M, and a plurality of second stage output ports, M, at least  
31 one second stage input port simultaneously receiving at least two second  
32 stage optical signals to be routed, ~~and~~ at least one second stage output  
33 port simultaneously presenting at least two second stage routed optical  
34 signals, and at least one output port coupling routed optical signals to a  
35 plurality of output channels, the second stage frequency router routing  
36 second stage optical signals by color dynamically in response to said  
37 destination information.

- 1 15. (original) The optical router of Claim 14, further comprising a plurality of  
2 output stage receivers, each output stage receiver having an output stage

demultiplexer, one output stage demultiplexer presenting each of the at least two second stage routed optical signals from the second stage frequency router to an intended destination.

16. (original) The optical router of Claim 14, further comprising a plurality of output stage receivers, each output stage receiver comprising:

at least two tunable filters for tuning to a color; and

a splitter coupled with the at least two tunable filters, wherein one output stage receiver splits the at least two second stage routed optical signals between the corresponding at least two tunable filters such that at least one of the at least two tunable filters is tuned to pass one of the at least two second stage routed optical signals to an intended destination.

17. (original) The optical router of Claim 14, wherein each first stage converter comprises a first stage tunable light source for generating one optical signal, and for coloring the one optical signal in response to the destination information of the respective packet of data, each second stage converter comprises a second stage tunable light source for generating one second stage optical signal, and for coloring the one second stage optical signal in response to the destination information of the respective packet of data, and further comprising a scheduler for scheduling the coloring of each optical signal and each second stage optical signal.



1 18. (original) The optical router of Claim 17, wherein each first stage  
2 converter comprises a first stage converter for converting at least one packet of  
3 data to the one optical signal colored in response to destination information of  
4 the respective packet of data, each second stage converter comprises a second  
5 stage converter for coloring one second stage optical signal in response to  
6 destination information of the respective packet of data.

1 19. (original) The optical router of Claim 14, wherein at least one of the first  
2 and the second stage frequency routers comprise:

3 at least one input waveguide;

4 at least one output waveguide;

5 a first and a second free space region, the first free space region  
6 coupled with the at least one input waveguide and the second free space  
7 region coupled with the at least one output waveguide; and

8 an optical grating having a plurality of unequal length waveguides,  
9 each unequal length waveguide coupled between the first free space  
10 region and the second free space region.

1 20. (original) The optical router of Claim 14, wherein ~~the first and the second~~  
2 ~~stage frequency routers are formed by one frequency~~ each second stage  
3 converter, in response to destination information, re-colors the optical signals  
4 that are received thereby.

1 21. (currently amended) A method for routing optical signals to a plurality of  
2 output channels comprising:

3 determining a first, second and third destination for a first, second  
4 and third packet of data, respectively;

5 generating a first, second and third carrier signal having a first,  
6 second and third frequency associated with the first, second and third  
7 destinations, respectively;

8 modulating the first, second and third carrier signals in response to  
9 the first, second and third packets of data to form a first, second and third  
10 optical signal; and

11 routing the first, second and third optical signals by a frequency  
12 routing device, the routing characterized by comprising:

13 simultaneously receiving in a first input of a frequency  
14 router at least two of the first, second and third signals; and

15 simultaneously presenting from a first output of the  
16 frequency router at least two of the first, second and third routed  
17 optical signals; and coupling routed optical signals from at least  
18 one output port to a plurality of output channels.

1 22. (currently amended) A method for routing a plurality of optical signals to  
2 a plurality of output channels as a function of color through a router having a  
3 plurality of ~~inputs~~ input ports and a plurality of ~~outputs~~ output ports, the  
4 method ~~comprising~~ characterized by the steps of:

5 simultaneously receiving ~~to~~at at least one of the input ports at least  
6 two optical signals respectively colored as a function of destination information  
7 contained therein; ~~and~~

8 simultaneously presenting ~~from~~to at least one of the output ports  
9 at least two optical signals routed as a function of their color; and coupling  
10 routed optical signals from at least one output port to a plurality of output  
11 channels.

1 **23. (currently amended)** The method of claim 22, after the presenting step  
2 further comprising the step of processing each of the presented at least two  
3 routed optical signals from the at least one of the output ports.

1 **24. (currently amended)** The method of claim 22, ~~wherein the step of~~  
2 ~~simultaneously applying to at least one of the input ports comprises further~~  
3 comprising the step of coloring each optical signal of the plurality ~~is as~~ a further  
4 function of which input port of the plurality of input ports it is applied to.

1 **25. (original)** A method for use in conjunction with a router which has a  
2 plurality of input ports and plurality of output ports, said router being of a type  
3 which routes optical signals applied to its input ports to particular ones of said  
4 output ports as a function of the respective colors of said optical signals, the  
5 method:

6 applying each of a plurality of optical signals to a respective one of the  
7 input ports, this including the step of concurrently applying to an  
8 individual one of said input ports at least two optical signals which have  
9 been respectively colored as a function of destination information

10 contained in said optical signals, at least two of said optical signals being  
11 concurrently routed to a particular one of said output ports.

1 26. **(original)** The invention of claim 25, comprising the further step of  
2 concurrently removing from said particular one of said output ports said two  
3 optical signals concurrently routed thereto.

1 27. **(original)** The invention of claim 25, wherein the coloring of each said  
2 optical signal is a further function of which input port it is applied to.

---